CLAIMS

1.   A method of manufacturing electronic circuits comprising:

generating CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and

employing said CAD data, said bill of materials and said approved component vendor list for automatically generating:

a pick & place machine-specific component loading specification;

a pick & place machine-specific component placement sequence; and

pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line.

2.   A method of manufacturing electronic circuits according to claim 1 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine specific component data for governing the operation of at least one specific pick & place machine includes:

automatically generating said pick & place machine-specific component data by employing a first database containing at least one of pick & place machine-independent, geometric component data and pick & place machine-independent, component supply data and a second database containing machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data.

3.   A method of manufacturing electronic circuits according to any of the preceding claims and wherein said pick & place machine specific component data for governing the operation of at least one specific pick & place machine comprises at least one of pick & place machine-specific component shape parameters and pick & place machine-specific component supply parameters.

4.	A method of manufacturing electronic circuits according to any of the preceding claims and wherein said automatically generating pick & place machine-specific component data comprises automatically generating a third database containing at least:

a mapping between component identifiers and pick & place machine-specific component shape parameters; and

a mapping between said component identifiers and pick & place machine-specific component supply parameters.

5.	A method of manufacturing electronic circuits according to claim 4 and wherein said mapping between component identifiers and pick & place machine-specific component shape parameters comprises:

a mapping of PCNs to component shape identifiers; and

a mapping of component shape identifiers to pick & place machine-specific component shape parameters.

6.	A method of manufacturing electronic circuits according to claim 5 and wherein said component shape identifiers are pick & place machine-specific component shape identifiers.

7.	A method of manufacturing electronic circuits according to any of claims 4 - 6 and wherein said mapping between said component identifiers and pick & place machine-specific component supply parameters comprises:

a mapping of PCNs to component supply identifiers; and

a mapping of component supply identifiers to pick & place machine-specific component supply parameters.

8.	A method of manufacturing electronic circuits according to claim 7 and wherein said component supply identifiers are pick & place machine-specific component supply identifiers.

9.   A method of manufacturing electronic circuits according to any of claims 4 - 8 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters;

component handling parameters;

component imaging parameters;

component recognition tolerances; and

pick & place machine-specific procedures.

10.   A method of manufacturing electronic circuits according to any of claims 4 - 9 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters in pick & place machine-specific syntax;

pick & place machine-specific component handling parameters;

pick & place machine-specific component imaging parameters;

pick & place machine-specific component recognition tolerances; and

pick & place machine-specific procedures.

11.   A method of manufacturing electronic circuits according to any of claims 4 - 10 and wherein said pick & place machine-specific component supply parameters include at least one of:

a component carrier type; and

pick & place machine-specific, component carrier-specific parameters.

12.   A method of manufacturing electronic circuits according to any of the preceding claims and wherein at least part of said pick & place machine-specific component data comprises adaptive pick & place machine-specific component data.

13.   A method of manufacturing electronic circuits according to claim 12 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component shape data.

14.		A method of manufacturing electronic circuits according to claim 12 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component supply data.

15.		A method of manufacturing electronic circuits according to any of claims 2 - 14 and wherein said first database comprises at least one of:

		a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

		a mapping of CV/Cat#s to component supply form parameters (CCSL);

		a mapping of PCNs to component supply form parameters (UMCSL);

		a mapping of PCNs to CV/Cat#s (MCVL);

		a mapping of DCN to PCN;

		a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

		a mapping of PCN to generic component geometric parameters.

16.		A method of manufacturing electronic circuits according to any of claims 2 - 15 and wherein said second database comprises at least one of:

		a mapping of component manufacturer-independent component characteristics to rules for generating pick & place machine-specific component shape parameters; and

		a mapping of component manufacturer-independent component supply form characteristics to rules for generating pick & place machine-specific component supply parameters.

17.		A method of manufacturing electronic circuits according to claim 16 and wherein said rules for generating pick & place machine-specific component shape parameters include rules for generating at least one of:

		component geometric parameters in pick & place machine specific syntax;

		pick & place machine specific component handling parameters;

pick & place machine specific component imaging parameters;

pick & place machine specific component recognition tolerances; and

pick & place machine specific procedures.

18.   A method of manufacturing electronic circuits according to claim 16 or claim 17 and wherein said rules for generating pick & place machine-specific component supply parameters include rules for generating at least one of:

a component carrier type in pick & place machine-specific syntax; and

component carrier type-specific parameters in pick & place machine-specific syntax.

19.   A method of manufacturing electronic circuits according to any of claims 16 – 18 and wherein said second database comprises at least one of:

a mapping of component manufacturer-independent component characteristics to rules for generating adaptive pick & place machine-specific component shape parameters; and

a mapping of component manufacturer-independent component supply form characteristics to rules for generating adaptive pick & place machine-specific component supply parameters.

20.   A method of manufacturing electronic circuits according to claim 19 and wherein said rules for generating adaptive pick & place machine-specific component shape parameters include rules for generating at least one of:

component geometric parameters in pick & place machine specific syntax;

adaptive pick & place machine specific component handling parameters;

adaptive pick & place machine specific component imaging parameters;

adaptive pick & place machine specific component recognition tolerances; and

pick & place machine specific procedures.

21.   A method of manufacturing electronic circuits according to claim 19 or claim 20 and wherein said rules for generating adaptive pick & place machine-specific component supply parameters include rules for generating at least one of:

adaptive component carrier type in pick & place machine-specific syntax; and

adaptive component carrier type-specific parameters in pick & place machine-specific syntax.

22.   A method of manufacturing electronic circuits according to any of claims 16 - 21 and wherein said second database is operator modifiable.

23.   A method of manufacturing electronic circuits according to any of the preceding claims and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine specific component data for governing the operation of at least one specific pick & place machine includes:

automatically generating said pick & place machine-specific component data by employing a fourth database containing pick & place line and machine configurations.

24.   A method of manufacturing electronic circuits according to claim 23 and wherein said fourth database comprises at least one of:

pick & place machine configurations;

ordered listings of pick & place machines in at least one machine line; and

pick & place machine configurations of said pick & place machines in said at least one machine line.

25.   A method of manufacturing electronic circuits according to claim 24 and wherein said pick & place machine configurations include at least one of:

camera types and characteristics;

illumination types and characteristics;

component feeder carriage types and characteristics;

component feeder types and characteristics;

nozzle types and characteristics; and

kinetic characteristics of moving elements.

26.　　　　A method of manufacturing electronic circuits according to either of claims 24 and 25 and wherein said pick & place machine configurations of said pick & place machines in said plurality of machine lines include at least one of:

mounted camera types;

mounted illumination types;

mounted component feeder carriages;

mounted component feeders; and

mounted nozzles.

27.　　　　A method of manufacturing electronic circuits according to any of claims 2 – 26 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine-specific component loading specification, pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line comprises:

employing said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components; and

employing said first database and said second database to auto-generate said pick & place machine specific component data.

28.　　　　A method of manufacturing electronic circuits according to claim 27 and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating pick & place machine-specific component loading specification, pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the

operation of at least one specific pick & place machine in a manufacturing line also comprises:

prior to said employing said CAD data said bill of materials, said approved component vendor list and said first database to search for component data for new components, employing said CAD data, said bill of materials and said approved component vendor list to form combined printed circuit assembly data;

following said employing said first database and said second database, selecting a pick & place machine line;

thereafter, employing said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line; and

thereafter, employing a computer to provide said pick & place machine-specific component loading specification, said pick & place machine-specific component placement sequence and said pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line to at least one pick & place machine in said pick & place machine line.

29.   A method of manufacturing electronic circuits according to claim 28, and wherein said combined printed circuit assembly data employs PCN designations.

30.   A method of manufacturing electronic circuits according to claim 28 or claim 29 and wherein said employing said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components comprises employing said combined printed circuit assembly data and said first database to search for said component data for new components.

31.   A method of manufacturing electronic circuits according to claim 30 and wherein said employing said combined printed circuit assembly data and said first database to search for component data for new components comprises:

searching said first database for pick & place machine independent component supply data for said new components; and

searching said first database for pick & place machine independent geometric component data for said new components.

32.   A method of manufacturing electronic circuits according to claim 31 and wherein said searching said first database for pick & place machine independent component supply data for said new components comprises:

selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available;

obtaining a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which CSF parameters are not available; and

employing said CV/CAT# to search at least part of said first database for corresponding CSF parameters.

33.   A method of manufacturing electronic circuits according to claim 32 and also comprising employing said CV/CAT# to search at least part of said first database for corresponding default CSF parameters.

34.   A method of manufacturing electronic circuits according to either of claims 32 and 33 and also comprising employing said at least one PCN to search at least part of said first database for at least one corresponding set of default CSF parameters.

35.   A method of manufacturing electronic circuits according to any of claims 32 – 34 and also comprising:

presenting said at least one corresponding set of default CSF parameters and said at least one PCN to an operator for selection of an appropriate set of CSF parameters.

36.   A method of manufacturing electronic circuits according to claim 35 and also comprising, following said presenting:

automatically adding said appropriate set of CSF parameters as CSF parameters to said first database for said at least one PCN; and

automatically adding said appropriate set of CSF parameters as default CSF parameters to said first database for CV/CAT#s corresponding to said at least one PCN.

37.   A method of manufacturing electronic circuits according to any of claims 32 – 34 and also comprising:

        providing manually generated CSF parameters for said at least one PCN;

        automatically adding said manually generated CSF parameters to said first database for said at least one PCN; and

        automatically adding said manually generated CSF parameters as default CSF parameters to said first database for CV/CAT#s corresponding to said at least one PCN.

38.   A method of manufacturing electronic circuits according to any of claims 32 – 37 and wherein said selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data which does not have CSF parameters.

39.   A method of manufacturing electronic circuits according to any of claims 32 – 37 and wherein said selecting at least one PCN corresponding to ones of said new components for which CSF parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data for which there are no pick & place machine specific component supply parameters.

40.   A method of manufacturing electronic circuits according to any of claims 31 – 39 and wherein said searching said first database for pick & place machine independent component supply data for said new components comprises:

        selecting at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

obtaining a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

employing said CV/CAT# to search at least part of said first database for corresponding GCG parameters.

41.   A method of manufacturing electronic circuits according to claim 40 and wherein said employing said CV/CAT# also comprises:

automatically adding said corresponding GCG parameters to said first database for said CV/CAT#; and

automatically adding said corresponding GCG parameters to said first database for other CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available.

42.   A method of manufacturing electronic circuits according to claim 40 and also comprising, following said employing said CV/CAT#, conducting a proximity search including:

searching said first database for at least one additional PCN having at least one corresponding CV/CAT#, which is different from said CV/CAT#, in common with said at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

searching said first database for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

employing said at least one different CV/CAT# to search at least part of said first database for GCG parameters corresponding to said at least one different CV/CAT#.

43.   A method of manufacturing electronic circuits according to claim 42 and also comprising:

presenting said GCG parameters corresponding to said at least one different CV/CAT# and said at least one PCN corresponding to ones of said new components for which GCG parameters are not available to an operator for approval.

44.   A method of manufacturing electronic circuits according to claim 43 and also comprising:

automatically adding said GCG parameters corresponding to said at least one different CV/CAT# to said first database as GCG parameters corresponding to CV/CAT#s corresponding to at least one of said at least one PCN corresponding to ones of said new components for which GCG parameters are not available and said at least one additional PCN; and

automatically indicating, for all CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available, said GCG parameters as being obtained by said proximity search.

45.   A method of manufacturing electronic circuits according to any of claims 40-43 and also comprising:

providing manually generated GCG parameters for said CV/CAT#;

automatically adding said manually generated GCG parameters to said first database for said CV/CAT#; and

automatically adding said manually generated GCG parameters to said first database for CV/CAT#s corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available.

46.   A method of manufacturing electronic circuits according to any of claims 40 – 45 and wherein said selecting at least one PCN corresponding to ones of said new components for which GCG parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data which does not have GCG parameters.

47.   A method of manufacturing electronic circuits according to any of claims 40 – 45 and wherein said selecting at least one PCN corresponding to ones of said new

components for which GCG parameters are not available comprises selecting at least one PCN in said combined printed circuit assembly data for which there are no pick & place machine specific component shape parameters.

48.   A method of manufacturing electronic circuits according to any of claims 28 – 47 and wherein said employing said first database and said second database to auto-generate said pick & place machine specific component data comprises:

employing said pick & place machine independent component supply data and said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data to auto-generate pick & place machine specific component supply parameters; and

employing said pick & place machine independent geometric component data and said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data to auto-generate pick & place machine specific component shape parameters.

49.   A method of manufacturing electronic circuits according to claim 48 and wherein said employing said pick & place machine independent component supply data comprises:

for a specific pick & place machine in said pick & place machine line, selecting at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

employing at least one generic component supply identifier to obtain CSF parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

employing at least part of said CSF parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said CSF parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

50.   A method of manufacturing electronic circuits according to claim 49 and also comprising, prior to said employing at least part of said CSF parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules, employing at least part of said CSF parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

51.   A method of manufacturing electronic circuits according to any of claims 48 – 50 and wherein said employing said pick & place machine independent geometric component data comprises:

for a specific pick & place machine in said pick & place machine line, selecting at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

employing at least one generic component shape identifier to obtain GCG parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

employing at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific

component data based on at least one of said GCG parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

52.		A method of manufacturing electronic circuits according to claim 51 and also comprising, prior to said employing at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules, employing at least part of said GCG parameters to auto-generate said corresponding pick & place machine specific component shape identifier.

53.		A method of manufacturing electronic circuits according to any of claims 27 – 52 and also comprising, prior to said employing said CAD data, said bill of materials, said approved component vendor list and said first database, automatically populating a CCL portion of said first database.

54.		A method of manufacturing electronic circuits according to claim 53 and wherein said automatically populating comprises employing a component library which maps CV/CAT#s to component packaging shape parameters.

55.		A method of manufacturing electronic circuits according to claim 54 and wherein said employing a component library comprises employing said component library which includes:

a first stage mapping which maps CV/CAT#s to component packaging shape identifiers; and

a second stage mapping which maps said component packaging shape identifiers to component packaging shape parameters.

56.		A method of manufacturing electronic circuits according to claim 55 and wherein said automatically populating comprises:

obtaining at least one CV/CAT# for which no mapping exists in said CCL portion;

employing said first stage mapping to obtain a component packaging shape identifier corresponding to said at least one CV/CAT#;

employing said second stage mapping to obtain component packaging shape parameters corresponding to said component packaging shape identifier corresponding to said at least one CV/CAT#;

employing said component packaging shape identifier corresponding to said at least one CV/CAT#;and said component packaging shape parameters corresponding to said component packaging shape identifier to provide an auto-generated generic component shape identifier and auto-generated GCG parameters; and

adding said auto-generated generic component shape identifier and said auto-generated GCG parameters to said CCL portion for said at least one CV/CAT#.

57.   A method of manufacturing electronic circuits according to claim 56 and wherein said automatically populating also comprises, prior to said adding:

employing said auto-generated generic component shape identifier to search said CCL portion for corresponding, previously generated GCG parameters;

comparing said previously generated GCG parameters and said auto-generated GCG parameters; and

if discrepancies are found, modifying said auto-generated generic component shape identifier to provide a modified generic component shape identifier and adding said modified generic component shape identifier and said auto-generated GCG parameters to said CCL portion for said at least one CV/CAT#.

58.   A method of manufacturing electronic circuits according to any of claims 28 – 57 and also comprising, following said employing said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line, assigning suitable variables to adaptive ones of said pick & place machine specific component data to provide pick & place machine specific component data which corresponds to a specific pick & place machine configuration for at least one pick & place machine in said pick & place machine line.

59.   A method of manufacturing electronic circuits according to any of the preceding claims and wherein said employing said CAD data, said bill of materials and said approved component vendor list for automatically generating does not require operator entry of pick & place machine-specific component data.

60.   A method of manufacturing electronic circuits comprising:

generating CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and

employing at least said CAD data, said bill of materials and said approved component vendor list for automatically locating generic component geometric parameters corresponding to components in said CAD data, including:

employing at least one database for automatically locating at least one equivalent of ones of said components for which generic component geometric parameters are not available; and

providing generic component geometric parameters corresponding to said at least one equivalent as generic component geometric parameters corresponding to said ones of said components for which generic component geometric parameters are not available.

61.   A method of manufacturing electronic circuits according to claim 60 and wherein said at least one database comprises a database containing pick & place machine-independent, geometric component data.

62.   A method of manufacturing electronic circuits according to claim 61 and wherein said database containing pick & place machine-independent, geometric component data comprises at least one of :

a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

a mapping of CV/Cat#s to component supply form parameters (CCSL);

a mapping of PCNs to component supply form parameters (UMCSL);

a mapping of PCNs to CV/Cat#s (MCVL);

a mapping of DCN to PCN;

a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

a mapping of PCN to generic component geometric parameters.

63.   A method of manufacturing electronic circuits according to any of claims 60 – 62 and wherein said employing at least one database for automatically locating comprises:

selecting at least one PCN corresponding to each of said ones of said components;

employing said at least one database to obtain at least one CV/CAT# corresponding to said at least one PCN;

searching said at least one database for at least one additional PCN having at least one additional corresponding CV/CAT#, which is different from said at least one CV/CAT#, in common with said at least one PCN;

searching said at least one database for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN; and

employing said at least one different CV/CAT# to search at least part of said at least one database for generic component geometric parameters corresponding to said at least one different CV/CAT#.

64.   A method of manufacturing electronic circuits according to claim 63 and wherein said providing generic component geometric comprises presenting said generic component geometric parameters corresponding to said at least one different CV/CAT# together with said at least one PCN to an operator for approval.

65.   A method of manufacturing electronic circuits according to claim 64 and wherein said providing generic component geometric parameters also comprises:

automatically adding said generic component geometric parameters corresponding to said at least one different CV/CAT# to said at least one database as generic component geometric parameters corresponding to CV/CAT#s corresponding to at least one of said at least one PCN and said at least one additional PCN; and

automatically indicating, for all CV/CAT#s corresponding to said at least one PCN, said generic component geometric parameters corresponding to said at least one different CV/CAT# as being obtained by a proximity search.

66.   A method of manufacturing electronic circuits according to claim 63 or claim 64 and wherein said providing generic component geometric parameters also comprises:

providing manually generated generic component geometric parameters for said at least one CV/CAT#;

automatically adding said manually generated generic component geometric parameters to said at least one database for said at least one CV/CAT#; and

automatically adding said manually generated generic component geometric parameters to said at least one database for CV/CAT#s corresponding to said at least one PCN.

67.   A method of manufacturing an electronic circuit comprising:

employing a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one specific pick & place machine to auto-generate generic component parameters for components used in manufacturing said electronic circuit on said at least one specific pick & place machine; and

employing said generic component parameters to auto-generate a pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the operation of at least one other specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one other specific pick & place machine.

68.   A method of manufacturing an electronic circuit according to claim 67 and wherein said at least one other specific pick & place machine is a different type of pick & place machine from said at least one specific pick & place machine.

69.   A method of manufacturing an electronic circuit according to either of claims 67 and 68 and wherein said employing a pick & place machine-specific component placement sequence, comprises employing at least a first database containing at least one of pick & place machine independent geometric component data and pick & place machine-independent, component supply data and a second database containing component manufacturer-independent, pick & place machine-specific rules.

70.   A method of manufacturing an electronic circuit according to claim 69 and wherein said at least second database includes at least one of the following mappings:

a mapping of pick & place machine-specific component shape parameters to rules for generating component manufacturer-independent generic component geometric parameters;

a mapping of pick & place machine-specific component supply parameters to rules for generating component manufacturer-independent generic component supply form parameters; and

a mapping of PCN parameters in pick & place machine specific synatx to generic PCN parameters.

71.   A method of manufacturing an electronic circuit according to either of claims 69 and 70 and wherein said first database comprises at least one of:

a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

a mapping of CV/Cat#s to component supply form parameters (CCSL);

a mapping of PCNs to component supply form parameters (UMCSL);

a mapping of PCNs to CV/Cat#s (MCVL);

a mapping of DCN to PCN;

a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

a mapping of PCN to generic component geometric parameters.

72.   A method of manufacturing an electronic circuit according to any of claims 69 - 71 and wherein said employing a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one specific pick & place machine to auto-generate generic component parameters for components used in manufacturing said electronic circuit on said at least one specific pick & place machine also comprises:

obtaining at least one PCN for ones of said components used in manufacturing said electronic circuit;

employing said at least one PCN and a type of said at least one specific pick & place machine to access relevant ones of said component manufacturer-independent, pick & place machine-specific rules;

operating said ones of said component manufacturer-independent, pick & place machine-specific rules using at least one pick & place machine specific component parameter to obtain corresponding values; and

assigning said values to corresponding generic component parameters.

73.   A method of manufacturing an electronic circuit according to claim 72 and wherein said obtaining comprises obtaining said at least one PCN from said operating instructions in computer-readable language.

74.   A method of manufacturing an electronic circuit according to either of claims 72 and 73 and wherein:

said operating comprises operating ones of said component manufacturer-independent, pick & place machine-specific rules which are suitable for auto-generation of generic component supply form parameters using at least one pick & place machine specific component supply parameter to obtain a corresponding supply form value; and

said assigning comprises assigning said corresponding supply form value to a corresponding generic component supply form parameter.

75.   A method of manufacturing an electronic circuit according to either of claims 72 and 73 and wherein:

said operating comprises operating ones of said component manufacturer-independent, pick & place machine-specific rules which are suitable for auto-generation of generic component geometric parameters using at least one pick & place machine specific component shape parameter to obtain a corresponding geometric value; and

said assigning comprises assigning said corresponding geometric value to a corresponding generic component geometric parameter.

76.   A method of manufacturing an electronic circuit according to any of claims 72 – 75 and also comprising, following said assigning:

adding said values and said corresponding generic component parameters to said first database for said at least one PCN; and

subsequently, indicating said values and said corresponding generic component parameters that were obtained by indirect association.

77.   A method of manufacturing an electronic circuit according to any of claims 69 – 76 and also comprising, prior to said employing a pick & place machine-specific component placement sequence:

obtaining at least one PCN for each of said components;

searching said first database for pick & place machine independent component supply data corresponding to said at least one PCN for each of said components; and

searching said first database for pick & place machine independent geometric component data corresponding to said at least one PCN for each of said components.

78.   A method of manufacturing an electronic circuit according to any of claims 67 – 77 and wherein said employing said generic component parameters comprises:

employing generic component supply form parameters and said second database for auto-generating pick & place machine specific component supply parameters; and

employing said generic component geometric parameters and said second database for auto-generating pick & place machine specific component shape parameters.

79.   A method of manufacturing an electronic circuit according to claim 78 and wherein said employing generic component supply form parameters comprises:

selecting at least one PCN corresponding to each of said components;

employing at least part of said generic component supply form parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules based on said third database and at least one of said generic component parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

80.   A method of manufacturing electronic circuits according to claim 79 and also comprising, prior to said employing at least part of said generic component supply form parameters, employing at least part of said generic component supply form parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

81.   A method of manufacturing electronic circuits according to any of claims 78 – 80 and wherein said employing said generic component geometric parameters comprises:

selecting at least one PCN corresponding to each of said components;

employing at least part of said generic component geometric parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said generic component geometric parameters to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

82.   A method of manufacturing electronic circuits according to claim 81 and also comprising, prior to said employing at least part of said generic component geometric parameters, employing at least part of said generic component geometric parameters to auto-generate a corresponding pick & place machine specific component shape identifier.

83.   A method of manufacturing an electronic circuit comprising:

employing a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one specific pick & place machine to obtain generic component geometric parameters for at least one specific component used in manufacturing said electronic circuit on said at least one specific pick & place machine; and

employing said generic component geometric parameters to auto-generate a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of said at least one specific pick & place machine and operating instructions in computer-readable language for said at least one specific pick & place machine when said at least one specific component is replaced by at least one substitute component.

84.		A method of manufacturing an electronic circuit according to claim 83 and wherein said employing a pick & place machine-specific component placement sequence comprises:

obtaining at least one PCN corresponding to said at least one specific component;

employing a database including pick & place machine independent geometric component data to obtain at least one CV/CAT# corresponding to said at least one PCN; and

employing said database and said at least one CV/CAT# to obtain generic component geometric parameters for said at least one specific component.

85.		A method of manufacturing an electronic circuit according to claim 84 and wherein said employing said generic component geometric parameters comprises:

obtaining at least one substitute PCN corresponding to said at least one substitute component;

employing said database to obtain at least one substitute CV/CAT# corresponding to said at least one substitute PCN;

employing said database and said at least one substitute CV/CAT# to obtain generic component geometric parameters for said at least one substitute component; and

comparing said generic component geometric parameters for said at least one specific component and said generic component geometric parameters for said at least one substitute component.

86.		A method of manufacturing an electronic circuit according to claim 85 and wherein said employing said generic component geometric parameters also comprises, following said comparing:

employing said database and machine-specific, component manufacturer-independent rules for generating pick & place machine-specific component shape parameters to auto-generate pick & place machine specific component shape parameters; and

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employing said pick & place machine specific component shape parameters to auto-generate said pick & place machine-specific component placement sequence, said pick & place machine-specific component data for governing the operation of said at least one specific pick & place machine and said operating instructions in computer-readable language for said at least one specific pick & place machine.

87.   A method of manufacturing an electronic circuit according to claim 86 and wherein said employing said database and machine-specific, component manufacturer-independent rules comprises:

employing at least part of said generic component geometric parameters for said at least one substitute component to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component shape parameters;

operating said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component shape parameters based on at least one of said generic component geometric parameters for said at least one substitute component to yield corresponding values; and

assigning said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

88.   Apparatus for manufacturing electronic circuits comprising:

a computerized electronic circuit data generator operative for generating CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and

a computerized generator operative for employing said CAD data, said bill of materials and said approved component vendor list for automatically generating:

a pick & place machine-specific component loading specification;

a pick & place machine-specific component placement sequence; and

pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line.

89.   Apparatus for manufacturing electronic circuits according to claim 88 and wherein said computerized generator includes:

a first database containing at least one of pick & place machine-independent, geometric component data and pick & place machine-independent, component supply data; and

a second database containing machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data.

90.   Apparatus for manufacturing electronic circuits according to either of claims 88 and 89 and wherein said pick & place machine specific component data for governing the operation of at least one specific pick & place machine comprises at least one of pick & place machine-specific component shape parameters and pick & place machine-specific component supply parameters.

91.   Apparatus for manufacturing electronic circuits according to any of claims 88-90 and wherein said computerized generator is also operative for automatically generating a third database containing at least:

a mapping between component identifiers and pick & place machine-specific component shape parameters; and

a mapping between said component identifiers and pick & place machine-specific component supply parameters.

92.   Apparatus for manufacturing electronic circuits according to claim 91 and wherein said mapping between component identifiers and pick & place machine-specific component shape parameters comprises:

a mapping of PCNs to component shape identifiers; and

a mapping of component shape identifiers to pick & place machine-specific component shape parameters.

93.   Apparatus for manufacturing electronic circuits according to claim 92 and wherein said component shape identifiers are pick & place machine-specific component shape identifiers.

94.   Apparatus for manufacturing electronic circuits according to any of claims 91-93 and wherein said mapping between said component identifiers and pick & place machine-specific component supply parameters comprises:

a mapping of PCNs to component supply identifiers; and

a mapping of component supply identifiers to pick & place machine-specific component supply parameters.

95.   Apparatus for manufacturing electronic circuits according to claim 94 and wherein said component supply identifiers are pick & place machine-specific component supply identifiers.

96.   Apparatus for manufacturing electronic circuits to any of claims 91-95 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters;

component handling parameters;

component imaging parameters;

component recognition tolerances; and

pick & place machine-specific procedures.

97.   Apparatus for manufacturing electronic circuits according to any of claims 91-96 and wherein said pick & place machine-specific component shape parameters include at least one of:

component geometry parameters in pick & place machine-specific syntax;

pick & place machine-specific component handling parameters;

pick & place machine-specific component imaging parameters;

pick & place machine-specific component recognition tolerances; and

pick & place machine-specific procedures.

98. Apparatus for manufacturing electronic circuits according to any of claims 91-97 and wherein said pick & place machine-specific component supply parameters include at least one of:

a component carrier type; and

pick & place machine-specific, component carrier-specific parameters.

99. Apparatus for manufacturing electronic circuits according to any of claims 88-98 and wherein at least part of said pick & place machine-specific component data comprises adaptive pick & place machine-specific component data.

100. Apparatus for manufacturing electronic circuits according to claim 99 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component shape data.

101. Apparatus for manufacturing electronic circuits according to claim 99 and wherein said adaptive pick & place machine specific component data comprises adaptive pick & place machine specific component supply data.

102. Apparatus for manufacturing electronic circuits according to any of claims 89-101 and wherein said first database comprises at least one of:

a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

a mapping of CV/Cat#s to component supply form parameters (CCSL);

a mapping of PCNs to component supply form parameters (UMCSL);

a mapping of PCNs to CV/Cat#s (MCVL);

a mapping of DCN to PCN;

a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

a mapping of PCN to generic component geometric parameters.

103.   Apparatus for manufacturing electronic circuits according to any of claims 89-102 and wherein said second database comprises at least one of:

a mapping of component manufacturer-independent component characteristics to rules for generating pick & place machine-specific component shape parameters; and

a mapping of component manufacturer-independent component supply form characteristics to rules for generating pick & place machine-specific component supply parameters.

104.   Apparatus for manufacturing electronic circuits according to claim 103 and wherein said rules for generating pick & place machine-specific component shape parameters include rules for generating at least one of:

component geometric parameters in pick & place machine specific syntax;

pick & place machine specific component handling parameters;

pick & place machine specific component imaging parameters;

pick & place machine specific component recognition tolerances; and

pick & place machine specific procedures.

105.   Apparatus for manufacturing electronic circuits according to either of claims 103 and 104 and wherein said rules for generating pick & place machine-specific component supply parameters include rules for generating at least one of:

a component carrier type in pick & place machine-specific syntax; and

component carrier type-specific parameters in pick & place machine-specific syntax.

106.	Apparatus for manufacturing electronic circuits according to any of claims 103 – 105 and wherein said second database comprises at least one of:

a mapping of component manufacturer-independent component characteristics to rules for generating adaptive pick & place machine-specific component shape parameters; and

a mapping of component manufacturer-independent component supply form characteristics to rules for generating adaptive pick & place machine-specific component supply parameters.

107.	Apparatus for manufacturing electronic circuits according to claim 106 and wherein said rules for generating adaptive pick & place machine-specific component shape parameters include rules for generating at least one of:

component geometric parameters in pick & place machine specific syntax;

adaptive pick & place machine specific component handling parameters;

adaptive pick & place machine specific component imaging parameters;

adaptive pick & place machine specific component recognition tolerances; and

pick & place machine specific procedures.

108.	Apparatus for manufacturing electronic circuits according to either of claims 106 and 107 and wherein said rules for generating adaptive pick & place machine-specific component supply parameters include rules for generating at least one of:

adaptive component carrier type in pick & place machine-specific syntax; and

adaptive component carrier type-specific parameters in pick & place machine-specific syntax.

109.	Apparatus for manufacturing electronic circuits according to any of claims 103 - 108 and wherein said second database is operator modifiable.

110.		Apparatus for manufacturing electronic circuits according to any of claims 88-109 and wherein said computerized generator includes:

a fourth database containing pick & place line and machine configurations.

111.		Apparatus for manufacturing electronic circuits according to claim 110 and wherein said fourth database comprises at least one of:

pick & place machine configurations;

ordered listings of pick & place machines in a plurality of machine lines; and

pick & place machine configurations of said pick & place machines in said plurality of machine lines.

112.		Apparatus for manufacturing electronic circuits according to claim 111 and wherein said pick & place machine configurations include at least one of:

camera types and characteristics;

illumination types and characteristics;

component feeder carriage types and characteristics;

component feeder types and characteristics;

nozzle types and characteristics; and

kinetic characteristics of moving elements.

113.		Apparatus for manufacturing electronic circuits according to either of claims 111 and 112 and wherein said pick & place machine configurations of said pick & place machines in said plurality of machine lines include at least one of:

mounted camera types;

mounted illumination types;

mounted component feeder carriages;

mounted component feeders; and

mounted nozzles.

114.   Apparatus for manufacturing electronic circuits according to any of claims 89-113 and wherein said computerized generator comprises:

computerized new component data searching functionality operative to employ said CAD data, said bill of materials, said approved component vendor list and said first database to search for component data for new components; and

computerized auto-generation functionality operative to employ said first database and said second database to auto-generate said pick & place machine specific component data.

115.   Apparatus for manufacturing electronic circuits according to claim 114 and wherein said computerized generator also comprises:

a computerized combined printed circuit assembly data generator operative to employ said CAD data, said bill of materials and said approved component vendor list to form combined printed circuit assembly data;

a computerized line selector operative to select a pick & place machine line;

computerized line balancing functionality operative to employ said combined printed circuit assembly data together with said pick & place machine specific component data to balance said pick & place machine line.

116.   A method of manufacturing electronic circuits according to claim 115, and wherein said combined printed circuit assembly data employs PCN designations.

117.   Apparatus for manufacturing electronic circuits according to any of claims 114-116 and wherein said computerized new component data searching functionality comprises:

computerized component supply data searching functionality operative to search said first database for pick & place machine independent component supply data for said new components; and

computerized component shape data searching functionality operative to search said first database for pick & place machine independent geometric component data for said new components.

118.   Apparatus for manufacturing electronic circuits according to claim 117 and wherein said computerized component supply data searching functionality comprises:

a PCN selector operative to select at least one PCN corresponding to ones of said new components for which CSF parameters are not available;

CSF CV/CAT# obtaining functionality operative to obtain a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which CSF parameters are not available; and

CSF searching functionality operative to employ said CV/CAT# to search at least part of said first database for corresponding CSF parameters.

119.   Apparatus for manufacturing electronic circuits according to either of claims 117 and 118 and wherein said computerized component shape data searching functionality comprises:

a PCN selector operative to select at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

GCG CV/CAT# obtaining functionality operative to obtain a CV/CAT# corresponding to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

GCG searching functionality operative to employ said CV/CAT# to search at least part of said first database for corresponding GCG parameters.

120.   Apparatus for manufacturing electronic circuits according to claim 119 and wherein said computerized component shape data searching functionality also comprises computerized proximity searching functionality, including:

first computerized searching functionality operative to search said first database for at least one additional PCN having at least one corresponding CV/CAT#, which is different from said CV/CAT#, in common with said at least one PCN corresponding to ones of said new components for which GCG parameters are not available;

second computerized searching functionality operative to search said first database for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN corresponding to ones of said new components for which GCG parameters are not available; and

proximate GCG parameter searching functionality operative to employ said at least one different CV/CAT# to search at least part of said first database for GCG parameters corresponding to said at least one different CV/CAT#.

121.　　　　Apparatus for manufacturing electronic circuits according to any of claims 114-120 and wherein said computerized auto-generation functionality comprises:

component supply parameter auto-generation functionality operative to employ said first database and said second database to auto-generate pick & place machine specific component supply parameters; and

component shape parameter auto-generation functionality operative to employ said first database and said second database to auto-generate pick & place machine specific component shape parameters.

122.　　　　Apparatus for manufacturing electronic circuits according to claim 121 and wherein said component supply parameter auto-generation functionality comprises:

a PCN selector operative, for a specific pick & place machine in said pick & place machine line, to select at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

CSF parameter obtaining functionality operative to employ at least one generic component supply identifier to obtain CSF parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component supply parameters and a corresponding pick & place machine specific component supply identifier is not available;

rules operating functionality operative to employ at least part of said CSF parameters to access appropriate ones of said machine-specific, component

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manufacturer-independent rules for generating said pick & place machine-specific component data and to operate said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said CSF parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

123. Apparatus for manufacturing electronic circuits according to claim 122 and wherein said component supply parameter auto-generation functionality also comprises component supply identifier auto-generation functionality operative to employ at least part of said CSF parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

124. Apparatus for manufacturing electronic circuits according to any of claims 121 – 123 and wherein said component shape parameter auto-generation functionality comprises:

a PCN selector operative, for a specific pick & place machine in said pick & place machine line, to select at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

GCG parameter obtaining functionality operative to employ at least one generic component shape identifier to obtain GCG parameters corresponding to said at least one PCN in said combined printed circuit assembly data for which at least one of corresponding pick & place machine specific component shape parameters and a corresponding pick & place machine specific component shape identifier is not available;

rules operating functionality operative to employ at least part of said GCG parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific

component data and to operate said appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data based on at least one of said GCG parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

125.   Apparatus for manufacturing electronic circuits according to claim 124 and wherein said component shape parameter auto-generation functionality also comprises component shape identifier auto-generation functionality operative to employ at least part of said GCG parameters to auto-generate said corresponding pick & place machine specific component shape identifier.

126.   Apparatus for manufacturing electronic circuits according to any of claims 114 – 125 and also comprising a computerized database populating functionality operative to automatically populate a CCL portion of said first database.

127.   Apparatus for manufacturing electronic circuits according to claim 126 and wherein said computerized database populating functionality also comprises component library which maps CV/CAT#s to component packaging shape parameters.

128.   Apparatus for manufacturing electronic circuits according to claim 127 and wherein said component library comprises:

a first stage mapping which maps CV/CAT#s to component packaging shape identifiers; and

a second stage mapping which maps said component packaging shape identifiers to component packaging shape parameters.

129.   Apparatus for manufacturing electronic circuits according to claim 128 and wherein said computerized database populating functionality comprises:

CV/CAT# obtaining functionality operative to obtain at least one CV/CAT# for which no mapping exists in said CCL portion;

component packaging shape identifier obtaining functionality operative to employ said first stage mapping to obtain a component packaging shape identifier corresponding to said at least one CV/CAT#; and

component packaging shape parameter obtaining functionality operative to employ said second stage mapping to obtain component packaging shape parameters corresponding to said component packaging shape identifier corresponding to said at least one CV/CAT#.

130.   Apparatus for manufacturing electronic circuits according to any of claims 114-129 and also comprising value assigning functionality operative to assign suitable variables to adaptive ones of said pick & place machine specific component data to provide pick & place machine specific component data which corresponds to a specific pick & place machine configuration for at least one pick & place machine in said pick & place machine line.

131.   Apparatus for manufacturing electronic circuits comprising:

a computerized electronic circuit data generator operative to generate CAD data, a bill of materials and an approved component vendor list for an electronic circuit; and

computerized component parameter locating functionality operative to employ at least said CAD data, said bill of materials and said approved component vendor list for automatically locating generic component geometric parameters corresponding to components in said CAD data, said computerized component parameter locating functionality including:

at least one database;

computerized equivalents locating functionality operative to automatically locate in said at least one database at least one equivalent of ones of said components for which generic component geometric parameters are not available; and

parameter providing functionality operative to provide generic component geometric parameters corresponding to said at least one equivalent as

generic component geometric parameters corresponding to said ones of said components for which generic component geometric parameters are not available.

132.   Apparatus for manufacturing electronic circuits according to claim 131 and wherein said at least one database comprises a database containing pick & place machine-independent, geometric component data.

133.   Apparatus for manufacturing electronic circuits according to claim 132 and wherein said database containing pick & place machine-independent, geometric component data comprises at least one of :

a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

a mapping of CV/Cat#s to component supply form parameters (CCSL);

a mapping of PCNs to component supply form parameters (UMCSL);

a mapping of PCNs to CV/Cat#s (MCVL);

a mapping of DCN to PCN;

a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

a mapping of PCN to generic component geometric parameters.

134.   Apparatus for manufacturing electronic circuits according to any of claims 131 – 133 and wherein said computerized equivalents locating functionality comprises:

computerized PCN selection functionality operative to select at least one PCN corresponding to each of said ones of said components;

CV/CAT# obtaining functionality operative to employ said at least one database to obtain at least one CV/CAT# corresponding to said at least one PCN;

computerized searching functionality operative to search said at least one database for at least one additional PCN having at least one additional corresponding CV/CAT#, which is different from said at least one CV/CAT#, in common with said at least one PCN and for at least one different CV/CAT# corresponding to said at least one additional PCN, which does not correspond to said at least one PCN; and

computerized component parameter searching functionality operative to employ said at least one different CV/CAT# to search at least part of said at least one database for generic component geometric parameters corresponding to said at least one different CV/CAT#.

135.   Apparatus for manufacturing electronic circuits according to claim 134 and wherein said providing generic component geometric comprises presenting said generic component geometric parameters corresponding to said at least one different CV/CAT# together with said at least one PCN to an operator for approval.

136.   Apparatus for manufacturing an electronic circuit comprising:

computerized generic component parameter auto-generation functionality operative to employ a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one specific pick & place machine to auto-generate generic component parameters for components used in manufacturing said electronic circuit on said at least one specific pick & place machine; and

computerized machine parameter auto-generation functionality operative to employ said generic component parameters to auto-generate a pick & place machine-specific component placement sequence and pick & place machine-specific component data for governing the operation of at least one other specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one other specific pick & place machine.

137.   Apparatus for manufacturing an electronic circuit according to claim 136 and wherein said at least one other specific pick & place machine is a different type of pick & place machine from said at least one specific pick & place machine.

138.   Apparatus for manufacturing an electronic circuit according to either of claims 136 and 137 and wherein said computerized generic component parameter auto-generation functionality comprises:

a first database containing at least one of pick & place machine independent geometric component data and pick & place machine-independent, component supply data; and

a second database containing component manufacturer-independent, pick & place machine-specific rules.

139.   Apparatus for manufacturing an electronic circuit according to claim 138 and wherein said second database includes at least one of the following mappings:

a mapping of pick & place machine-specific component shape parameters to rules for generating component manufacturer-independent generic component geometric parameters;

a mapping of pick & place machine-specific component supply parameters to rules for generating component manufacturer-independent generic component supply form parameters; and

a mapping of PCN parameters in pick & place machine specific synatx to generic PCN parameters.

140.   Apparatus for manufacturing an electronic circuit according to either of claims 138 and 139 and wherein said first database comprises at least one of:

a mapping of CV/Cat#s to component vendor-specific component geometric parameters (CCL);

a mapping of CV/Cat#s to component supply form parameters (CCSL);

a mapping of PCNs to component supply form parameters (UMCSL);

a mapping of PCNs to CV/Cat#s (MCVL);

a mapping of DCN to PCN;

a user maintained mapping of CV/Cat# to component vendor-specific component geometric parameters (UMCL); and

a mapping of PCN to generic component geometric parameters.

141.	Apparatus for manufacturing an electronic circuit according to any of claims 138-140 and wherein said computerized generic component parameter auto-generation functionality comprises:

PCN obtaining functionality operative to obtain at least one PCN for ones of said components used in manufacturing said electronic circuit;

rules operating functionality operative to employ said at least one PCN and a type of said at least one specific pick & place machine to access relevant ones of said component manufacturer-independent, pick & place machine-specific rules and to operate said ones of said component manufacturer-independent, pick & place machine-specific rules using at least one pick & place machine specific component parameter to obtain corresponding values; and

value assigning functionality operative to assign said values to corresponding generic component parameters.

142.	Apparatus for manufacturing an electronic circuit according to claim 141 and wherein said computerized generic component parameter auto-generation functionality also comprises:

computerized value addition functionality operative to add said values and said corresponding generic component parameters to said first database for said at least one PCN; and

value indicating functionality operative to indicate said values and said corresponding generic component parameters that were obtained by indirect association.

143.	Apparatus for manufacturing an electronic circuit according to any of claims 136-142 and wherein said computerized machine parameter auto-generation functionality comprises:

computerized supply parameter auto-generation functionality operative to employ generic component supply form parameters and said second database for auto-generating pick & place machine specific component supply parameters; and

computerized shape parameter auto-generation functionality operative to employ said generic component geometric parameters and said second database for auto-generating pick & place machine specific component shape parameters.

144.   Apparatus for manufacturing an electronic circuit according to claim 143 and wherein said computerized supply parameter auto-generation functionality comprises:

PCN selection functionality operative to select at least one PCN corresponding to each of said components;

rules operating functionality operative to employ at least part of said generic component supply form parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data and to operate said appropriate ones of said machine-specific, component manufacturer-independent rules based on said third database and at least one of said generic component parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component supply parameters.

145.   Apparatus for manufacturing an electronic circuit according to claim 144 and wherein said computerized supply parameter auto-generation functionality also comprises computerized supply identifier auto-generation functionality operative to employ at least part of said generic component supply form parameters to auto-generate said corresponding pick & place machine specific component supply identifier.

146.   Apparatus for manufacturing an electronic circuit according to any of claims 143-145 and wherein said computerized shape parameter auto-generation functionality comprises:

PCN selection functionality operative to select at least one PCN corresponding to each of said components;

rules operating functionality operative to employ at least part of said generic component shape parameters to access appropriate ones of said machine-specific, component manufacturer-independent rules for generating said pick & place machine-specific component data and to operate said appropriate ones of said machine-

specific, component manufacturer-independent rules based on said third database and at least one of said generic component parameters to yield corresponding values; and

value assigning functionality operative to assign said corresponding values to corresponding ones of said pick & place machine-specific component shape parameters.

147.   Apparatus for manufacturing an electronic circuit according to claim 145 and wherein said computerized shape parameter auto-generation functionality also comprises computerized shape identifier auto-generation functionality operative to employ at least part of said generic component shape parameters to auto-generate said corresponding pick & place machine specific component shape identifier.

148.   Apparatus for manufacturing an electronic circuit comprising:

computerized component parameter obtaining functionality operative to employ a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of at least one specific pick & place machine in a manufacturing line and operating instructions in computer-readable language for said at least one specific pick & place machine to obtain generic component geometric parameters for at least one specific component used in manufacturing said electronic circuit on said at least one specific pick & place machine; and

computerized auto-generation functionality operative to employ said generic component geometric parameters to auto-generate a pick & place machine-specific component placement sequence, pick & place machine-specific component data for governing the operation of said at least one specific pick & place machine and operating instructions in computer-readable language for said at least one specific pick & place machine when said at least one specific component is replaced by at least one substitute component.

149.   Apparatus for manufacturing an electronic circuit according to claim 148 and wherein said computerized component parameter obtaining functionality comprises:

PCN obtaining functionality operative to obtain at least one of at least one PCN corresponding to said at least one specific component and at least one substitute PCN corresponding to said at least one substitute component;

CV/CAT# obtaining functionality operative to employ a database including pick & place machine independent geometric component data to obtain at least one of at least one CV/CAT# corresponding to said at least one PCN and at least one substitute CV/CAT# corresponding to said at least one substitute PCN;

component geometric parameter obtaining functionality operative to employ said database, said at least one CV/CAT# and said at least one substitute CV/CAT# to obtain generic component geometric parameters for at least one of said at least one specific component and at least one substitute component; and

geometric parameter comparing functionality operative to compare said generic component geometric parameters for said at least one specific component and said generic component geometric parameters for said at least one substitute component.